

# NCMS: Lean & Sustainability Programs

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Since 1986

**ncms**

**National Center for  
Manufacturing Sciences**

Celebrating over **20** Years  
of Ideas **20** that Work

# NCMS Mission

The NCMS mission is to lead the rapid development of **cross-industry** R&D programs to build the global competitiveness of its manufacturing industry partners.

Complete Suite of “**Venture Catalyst**” and **Technology Deployment Services** in a Not-for-Profit



# What NCMS Does...

- **CONNECTION**- Value-adding expert **program management**, linking technology providers with end-users/suppliers to work on **real issues**
- **MECHANICS**- Provides **neutral third party facilitation** of intellectual property management, project management, and collaboration agreements
- **EXECUTION**- Research & development activities are conducted through the **leveraged resources** of its members and participants

# Program Areas Relevant to IMS

- Sustainability (Lean and/or Green)
- Energy Efficiency
- Nanomanufacturing

# NCMS -DOE Hydrogen Fuel Cell Systems Manufacturing Program

- **Timeline**
  - **Start:** October 2004
  - **End:** September 2008
  - 75% Percent complete
- **Technology Barriers for Fuel Cells & H<sub>2</sub> Storage**
  - Affordability
  - Durability
  - Weight, Volume
  - Robustness
  - Supply Chains
- **Budget**
  - **Total:** \$6,179,040
- **Partners**
  - **Total:** 22 Partners
  - **8 Collaborative Projects**



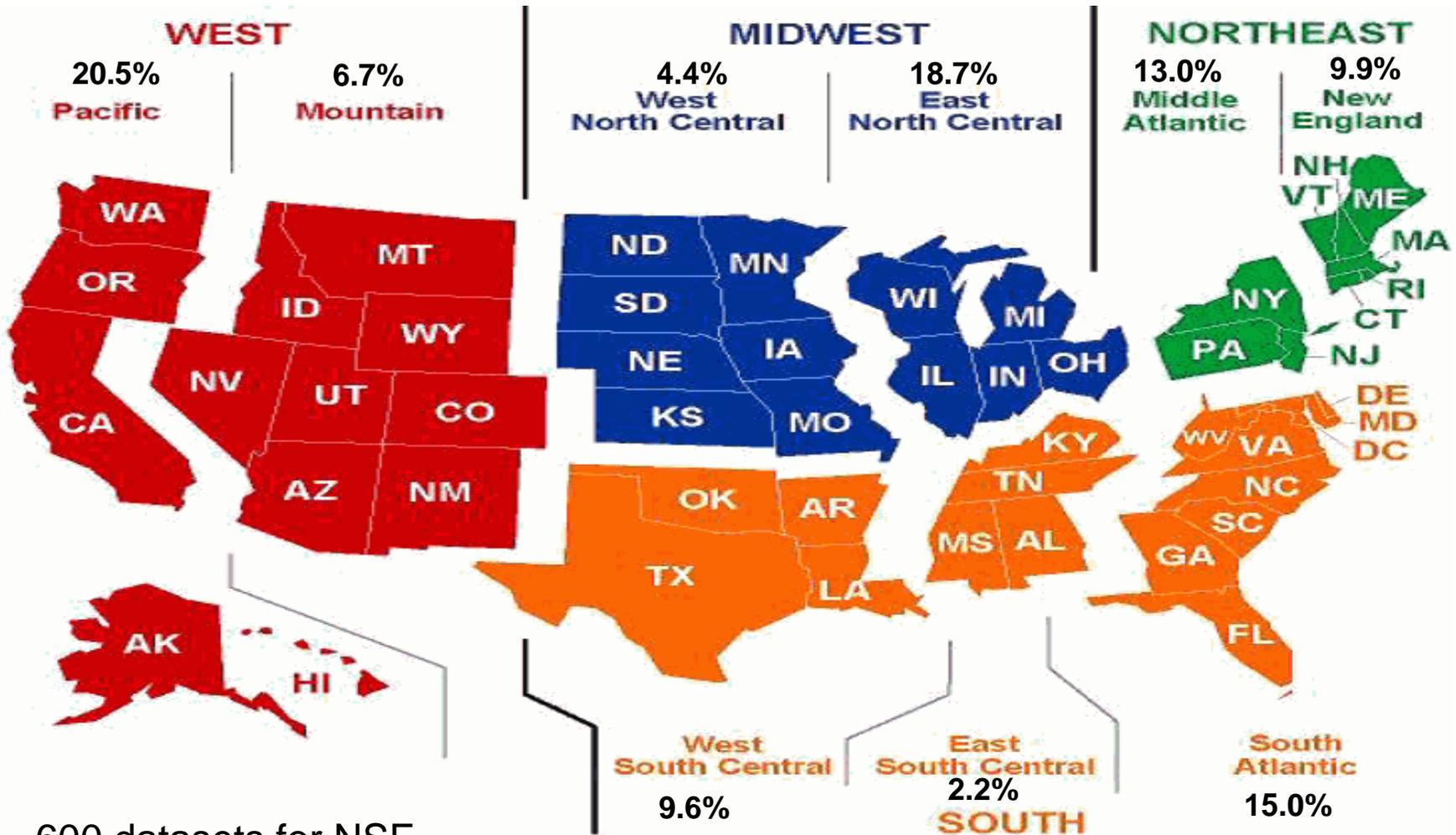
# NCMS/DoE H<sub>2</sub> Projects & Industry Partners



1. Affordable High-Rate Manufacturing of Vehicle Scale Carbon Composite High-Pressure Hydrogen Storage Cylinders (Profile, Toyota, Cincinnati Machines, A&P)
2. Non-Destructive Testing and Evaluation Methods (ASME Consortium)
3. Manufacturable Chemical Hydride Fuel System Storage for Fuel Cell Systems (Millenium Cell, Dow, NextEnergy, Edison Welding Inst)
4. Novel Manufacturing Process for PEM Fuel Cell Stacks (Protonex, Parker-Hannifin)
5. Innovative Inkjet Printing for Low-Cost, High-Volume Fuel Cell Catalyst Coated Membrane (CCM) Manufacturing (Cabot, MTI Micro Fuel Cells)
6. Manufacture of Durable Seals for PEM Fuel Cells (UTC Fuel Cells, Freudenberg-NOK)
7. Qualifying Low-cost High-volume Manufacturing Technologies For PEM Fuel Cell Power Systems (UTC Fuel Cells, General Pattern)
8. Develop Low Cost MEA3 Process for Roll-to-Roll Manufacturing of CCMs for DMFC Fuel Cells (DuPont, SFC)

# Distribution of U.S. Nanotech Industry

Source: NCMS-NSF Nanomfg Industry Survey Report (2006)



600 datasets for NSF

# NCMS Environmental Programs

- Over forty projects completed since 1991
- Wide breadth of industries/issues
- Env. compliance, performance, sustainability issues
- Perform surveys and studies, identify and capture knowledge & best practices
- Deploy via Reports, Guides, Online DB & Tools, Workshops

# Past Environmental Projects (examples)

- Pollution Prevention Practices for Die Casting Industry
- Metalworking Fluids Optimization Guide
- Lead-Free Solder Project
- Alternatives to Chromium for Aluminum Conversion Coating
- Metal Finishing Sector:
  - Pollution Prevention and Control (“Blue book”)
  - Benchmarking Environmental Performance
  - Strategic Goals Program
- Environmental Roadmapping Initiative  
(<http://ecm.ncms.org/eri/new/index.html>)
- Biological Air Pollution Control System
- Pulse Plating Process for Functional Trivalent Chrome
- Greenscore® Environmental Self-Assessment Program

# Active Projects

## ▪ CTMA Projects

- Development of advanced tooling for hard chrome plating at Corpus Christi Army Depot
- Similar project at North Island Navair facility

## ▪ Sustainable Product Initiative (SPI)

- Automotive Materials Selection Guide (DB/Tool)
  - Identify parts, mat'ls, regulations, alternate mat'ls, sust. issues (<http://ecm.ncms.org/AutoGuide>)
- Assist with sustainability standards development efforts now underway in office furniture and textile sectors
- Projects in other sectors currently under development (pharma, appliances, aerospace, etc)

# Active Projects (cont'd)

- **Benchmarking Environmental Performance**
- **Projects include:**
  - Beneficial sand reuse, metal casting industry
  - Environmental performance, printed wiring board fabrication
  - Waste minimization, electronic assembly
  - Report on the “Future of Finishing”
- **Life Cycle Assessment of Volatile Organic Compounds in Paints and Coatings (LCA-VOC)**
  - Develop consistent set of standards for evaluating coatings, acceptable to all stakeholders

# Active Projects (cont'd)

- **Compliance Assistance Center Related Projects**
  - Compliance Assistance Platform (infrastructure for numerous websites) ([www.EnvCAP.org](http://www.EnvCAP.org))
  - Develop and maintain Centers for:
    - Metal Finishing ([www.nmfrc.org](http://www.nmfrc.org))
    - Paints and Coatings ([www.paintcenter.org](http://www.paintcenter.org))
    - Construction ([www.CICAcenter.org](http://www.CICAcenter.org))
    - Healthcare ([www.HERCenter.org](http://www.HERCenter.org))
    - Printed Wiring Boards ([www.pwbrc.org](http://www.pwbrc.org))
    - Automotive Recycling ([www.ECARcenter.org](http://www.ECARcenter.org))
    - Border Issues ([www.BorderCenter.org](http://www.BorderCenter.org))

# Emerging Projects

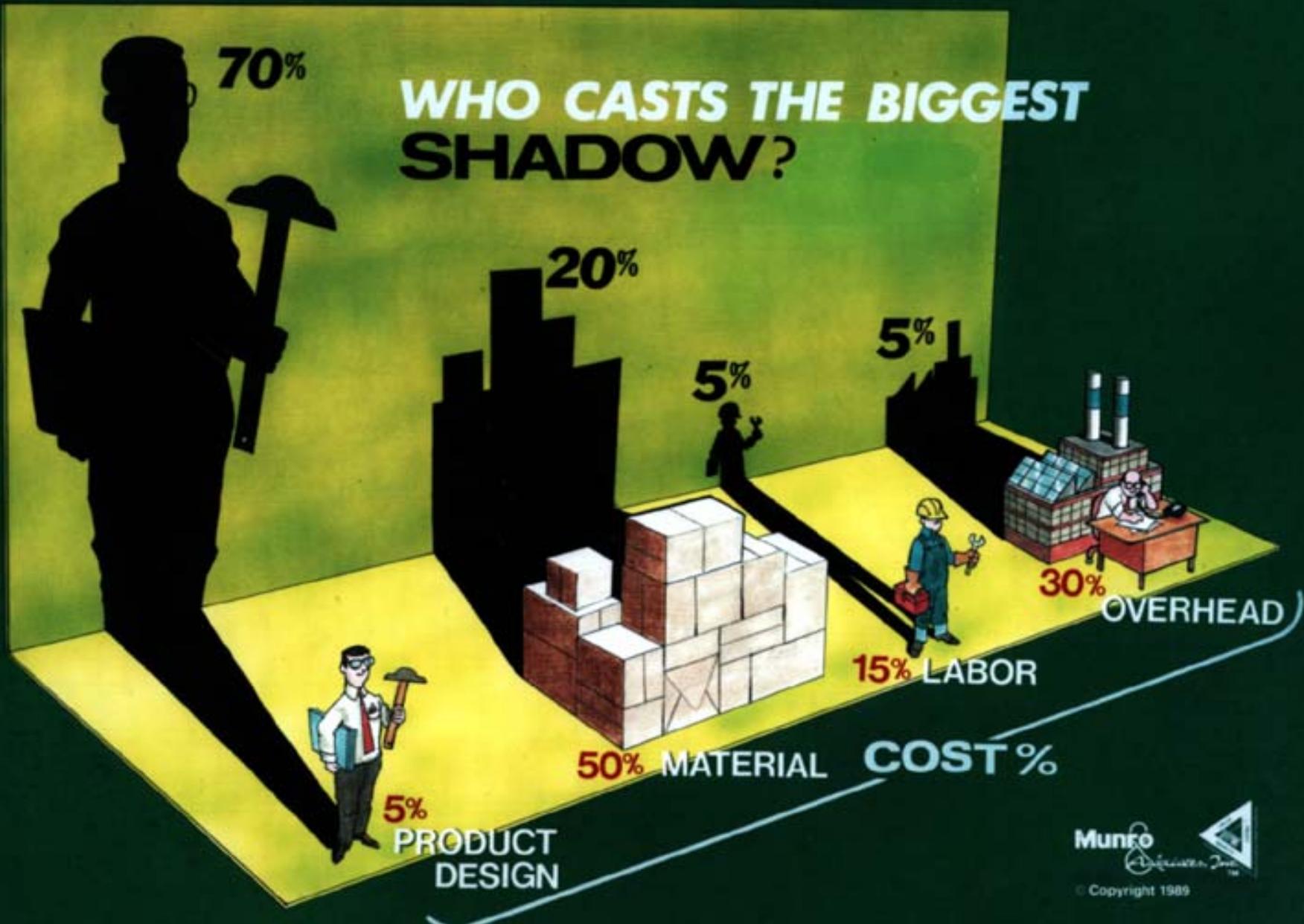
- **CTMA - Advanced Tooling for Nickel Plating**
- **CTMA – Validation of Functional Trivalent Chromium Plating Process (Phase 2)**
  - Enhancing an alternate electroplating process using trivalent chromium to go from decorative coating (thin and soft) to functional coating (thicker & wear resistant)
- **Enhance information-sharing capabilities of State Resource Locators**
  - State-by-state environmental regulations, guides, ([www.EnvCAP.org/statetools/index.cfm](http://www.EnvCAP.org/statetools/index.cfm))
- **Lean & Green Product Development Initiative**
  - Integration of product sustainability considerations with existing program of Toyota product development system principles & methodologies

# Emerging Projects (cont'd)

- Attainable Standards for Sustainable Products
  1. A How-To Guide for considering impacts built into a product, reflecting accumulated upstream impacts and downstream impacts associated with projected use and disposal
  2. Product standards need to convey enough information to enable consumers to evaluate impacts in a meaningful way (e.g. nutrition data on a cereal box!)

# WHO CASTS THE BIGGEST SHADOW?

INFLUENCE %



Munro



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# Lean & Green Product Design

- For this discussion:
  - **Lean Product Design** means the principles and methodology of Toyota's product design system
  - **Green Product Design** means incorporation of all sustainability considerations into the product during the design phase
  - **Lean & Green Product Design** means the integration of the above two principles

# Lean Product Development

- **Is not** a re-application of the principles of Lean Manufacturing
- It is ***Creating and leveraging knowledge to create an ongoing stream of great profitable products***
- Product Development requires innovation and the open-minded application of profound knowledge—Manufacturing cannot tolerate this!

# Green Product Development

- **Covers entire life-cycle of the product, including**
  - Raw materials
  - Manufacturing
  - Use
  - End-of-life (disposal or recycling)
- **Measures product's negative impacts, including**
  - Resource depletion
  - Emission of toxic wastes and greenhouse gases
  - Degradation of quality of life (aesthetics, noise)

# NCMS Offerings...

## <http://lpdi.ncms.org>

- Lean and Green training program
- Customized databases and interfaces
- Product evaluation tools for specific industry sectors (e.g. furniture, aerospace, etc)
- Value-added services associated with evaluation tools
  - Standards development
  - Training
  - Special research topics